In situ Neutron Diffraction study of B2 ordered FeCo under compressive loading

S. Kabra[1], E.P. George[2] and D. W. Brown[1]

[1] Los Alamos National Laboratory, Los Alamos, NM
[2] Oak Ridge National Laboratory, Oak Ridge, TN

FeCo near equiatomic compositions is well known for its excellent magnetic properties. It is, however, limited in its applicability because of brittleness under tensile stress. The brittleness of B2 ordered alloys in general and ordered FeCo in particular is an unexpected phenomenon given the high symmetry of the B2 crystal structure and the abundance of <111> type directions and {110} type planes for ½ <111>{110} slip. In order to study the deformation mechanism in these alloys, i*n situ* neutron diffraction experiments were performed at the SMARTS diffractometer at Los Alamos Neutron Science Centre. The *in situ* experiment did not show any signs of a phase transformation (as was hypothesized by Krcmar et. al.) occurring up to an applied strain of ~5%. However, the diffraction pattern showed many anomalous changes during loading. Along with unusual changes in peak positions, the most notable changes occurred in the intensities of FeCo peaks. As a general trend, the fundamental peaks increased in intensity while the superlattice peaks decreased. These intensity changes along with supporting experiments (texture on HIPPO diffractometer and metallography) show that APB induced disorder is introduced as the sample is loaded. The abruptness of increase/decrease in intensities at the yield point corroborates the assertion by Marcinkowski et. al. that, in the ordered alloy, slip is confined to certain planes in the absence of cross slipping.